

## **REMARKS/ARGUMENTS**

Reconsideration of this application is requested. Claims 1-26 are in the case.

### **I. THE INTERVIEW**

At the outset, the undersigned wishes to thank the Examiner (Mr. Oh) and his supervisor (Mr. Killos) for conducting an interview in this application. The interview was held on July 8, 2004, and was attended by Dr. Mark Roberts and Ms. Caron Brooke from the assignee corporation, as well as by the undersigned. The Examiner kindly indicated that the present amendment will be entered. The courtesies extended by the Examiner and his Supervisor during the interview were most appreciated. The substance of the interview will be clear from the comments presented below.

### **II. THE 35 U.S.C. §112, FIRST PARAGRAPH, REJECTION**

It is noted, with appreciation, that this rejection has been withdrawn, as indicated on page 2 of the Advisory Action.

### **III. THE 35 U.S.C. §103 REJECTIONS**

Claims 1, 4, 7 and 11-23 stand rejected under 35 U.S.C. §103(a) as allegedly unpatentable over U.S. Patent 5,162,578 to McCain, Jr. et al in view of U.S. Patent 4,899,003 to Manyik et al. Claims 2, 3, 5, 6 and 8-10 stand rejected under 35 U.S.C. §103(a) as allegedly unpatentable over U.S. Patent 3,458,406 to Fisher et al in view of Manyik et al. Those rejections are respectfully traversed.

For discussion purposes during the interview, a proposed amended set of claims was presented for consideration by the Examiner and his Supervisor. Based on the outcome of the interview during which the Examiner indicated in the Interview Summary Record that the issues in the Advisory Action will be reconsidered and the proposed amended claims will be entered, the claims submitted for discussion during the interview are presented with this Amendment. As explained during the interview, claim 1 has been amended to remove optional statements and also to more positively recite the adjusting or maintaining step in which the molar ratio of alkylene to carboxylic acid is adjusted or maintained by controlling the concentration of the alkylene introduced in the oxidation reaction zone. Claims 2 and 3 have been amended to include similar language. No new matter is entered and no new issues are raised with these amendments. The remaining dependent claims 2-23 are as presented before. New claims 24 -26 are dependent claims which are dependent on claim 1, 2 or 3 and recite the optional features deleted from claims 1, 2 and 3. Again, no new matter is entered and no new issues are raised.

As explained during the interview, claim 1 of the present invention requires that both an alkane, such as ethane, and an alkene, such as ethylene, are reacted with oxygen in the presence of a catalyst to produce both a carboxylic acid such as acetic acid and an alkene such as ethylene. The inventive concept underlying the present invention is the discovery that the molar ratio of carboxylic acid to alkene in the product can be tailored by controlling the concentration of alkene reactant introduced in the oxidation reaction zone. Applicants urged during the interview that the cited art does not disclose or suggest the concept of adjusting or maintaining the molar ratio of alkene

to carboxylic acid produced in the oxidation reaction zone by controlling the concentration of alkene introduced into the oxidation reaction zone. Absent any such suggestion, it is clear that a *prima facie* case of obviousness has not been generated in this case.

McCain aims to provide a mixed catalyst composition which produces predominantly acetic acid from ethane and/or ethylene in a process which is selective to acetic acid (column 3, lines 7-8 and lines 50-54). McCain is not interested in ethylene as a product. McCain discloses that the solution for achieving selectivity to acetic acid is to use a mixture of two catalyst species (column 3, lines 58-61). At column 1, lines 45-48, McCain states that the prior art reference, US 4,524,236, does not suggest or disclose mixed catalyst compositions for selective acid production.

Manyik relates to a process for the conversion of ethane to ethylene (column 1, lines 6-7). The process is multistage such that ethane is reacted with oxygen in the presence of a catalyst to produce an output stream comprising ethylene, acetic acid, water and unreacted ethane and oxygen. The composition of this output stream is altered by adjusting the amount of acetic acid and/or water in the stream (col 1 lines 32-48; claim 1). At col. 6 lines 61-63, Manyik states that the preferred catalysts for use in the invention are those described in US 4,524,236.

The Examiner's statement that there is a motivation to combine McCain and Manyik is not correct. The aims and processes of McCain and Manyik are different. McCain is specifically directed to the production of only acetic acid (column 3, lines 7-8 and lines 50-54), i.e. McCain leads specifically away from producing both acetic acid and ethylene, which is the subject-matter of Manyik. Thus, there would be no

motivation for the skilled person to employ the teachings of a process aimed at producing solely acetic acid with a process which is totally contrary to this aim, i.e. one that aims to reduce the production of acid by producing ethylene as well. This is corroborated by:

(a) the nature of the catalysts used in McCain and Manyik. Manyik states at column 6, lines 56-63 that the preferred catalysts for use in the process of Manyik are those of US 4,524,236 which relates to a process for the conversion of ethane to ethylene. These catalysts are stated by McCain as not being able to selectively produce acetic acid and therefore cannot achieve the invention of McCain (column 1, lines 45-48);

(b) any ethylene by-product produced in McCain is recycled to make more of the desired acetic acid (column 4, lines 30-34).

The Examiner states that Manyik indicates that the addition of water results in high acetic acid selectivity whilst reducing the ethylene selectivity and therefore the skilled person would be motivated to incorporate Manyik's ethane and water into the process of McCain to increase the selectivity to acid. Applicant's disagree.

Example 1 of McCain employs water (column 11, line 13) and two runs of the experiment are carried out. In Run A, the catalyst system of McCain's invention is employed; in Run B, a comparative experiment is conducted using the preferred catalyst system of Manyik (i.e. MoVNbSbCa — see column 7, line 20 of Manyik). In Run A, 63 mol% acid is obtained; in Run B only 32 mol% acid is obtained. Thus, McCain teaches that by employing his catalyst system, increased selectivity to acid may be achieved over Manyik. Based on this, there would be no incentive for the skilled

person to incorporate any teaching from Manyik to McCain to increase selectivity to acid because McCain is already an improved process for acid production over Manyik. Even if the skilled person did choose to add additional water, greater selectivity to acid may or may not be obtained in McCain because the nature of the catalyst in McCain is different to that of Manyik.

Furthermore, even if the addition of water did achieve further selectivity to acetic acid, it is irrelevant. An essential requirement of present claim 1 is that the ethylene concentration is controlled so as to adjust the molar ratio of ethylene to acetic acid produced. McCain does not disclose or suggest this concept. Hence, a combination of McCain and Manyik would not lead the skilled person to the present invention.

The Examiner refers to Example 2 of McCain. Example 2 describes Run A which uses the catalyst invention of McCain and Run B which is a comparative experiment using the preferred catalyst of Manyik. Ethylene is reacted with oxygen to produce acetic acid and carbon oxides. In Run A, selectivity to acetic acid was 74 mol%, in Run B it dropped to the low value of 41 mol%. Thus, much poorer results are obtained by using the system of Manyik. Thus, McCain leads one of ordinary skill away from employing the inferior process and teaching of Manyik.

The Examiner states that ethylene is a required feed component in McCain. It quite clearly is not. McCain clearly states, at column 1, lines 7-9, that acetic acid may be produced by the catalytic oxidation of ethane or ethylene or mixtures of ethane and ethylene. Thus, ethane may be used as the sole hydrocarbon feed component. The Examiner is directed to Example 7 of McCain in which the oxidation of ethane alone was carried out.

During the interview, the Examiner referred to column 5, line 35 of Manyik as allegedly relevant. However, that passage simply states that "ethane and ethylene have a significant impact on the rate at which acetic acid is formed." This passage is irrelevant to the present case and the claimed invention is not concerned with rate of formation of acetic acid.

Thus, for the above reasons and contrary to the Examiner's assertions, the skilled person would have no incentive to combine the teachings of McCain and Manyik and even if that person did so, neither McCain nor Manyik teaches that by varying the ethylene concentration, the product molar ratio may be adjusted/maintained at a pre-determined value. Withdrawal of the obviousness rejection is accordingly respectfully requested.

Referring to the obviousness rejection over Fisher in view of Manyik, claims 2 and 3 are independent claims directed to integrated processes having as a first step, the oxidation process of claim 1 to produce acetic acid and ethylene and reacting these products in a second step to produce either an alkyl carboxylate, such as ethyl acetate (claim 2) or an alkenyl carboxylate, such as vinyl acetate (claim 3). Fisher relates to the purification of vinyl acetate by removal of methyl acetate and ethyl acetate impurities. The vinyl acetate is produced by reacting ethylene, acetic acid and oxygen in the presence of a catalyst.

The Examiner states that, on the contrary to applicant's assertion, Manyik does disclose that the molar ratio of alkene to carboxylic acid can be obtained from the total output by controlling the method with or without the removal of water and acetic acid. Applicant is unclear as to where in any of Applicant's responses, it has been contended

that the composition of the product stream is not adjusted by altering the amount of water and/or acid contained therein prior to a second catalytic stage to produce product ethylene. However, Applicant does contend that Manyik is completely silent on any suggestion of controlling ethylene reactant concentration to tailor acid and ethylene product ratio.

The Examiner states that Fisher has focused on the production of the final products, alkyl carboxylate and alkenyl carboxylate by using ethylene and acid. This is incorrect. Fisher is directed to the purification of vinyl acetate to remove methyl and ethyl acetate impurities (Col. 1 lines 45-52 lines 65-67; Col 2 lines 20-23; Col. 4 line 49). Thus, the only final product in Fisher is vinyl acetate.

Fisher relates to vinyl acetate. Manyik relates to ethylene and acetic acid. The two references therefore relate to completely different technical fields. In addition, Fisher is only concerned with vinyl acetate that has already been produced, and is not concerned at all with processes on how to make vinyl acetate. Thus, contrary to the Examiner's contentions, the skilled person would have no motivation to combine the teachings of Fisher and Manyik. Furthermore, as neither Fisher nor Manyik provides any teaching or suggestion on how to tailor the acetic acid to ethylene product ratio via controlling ethylene reactant concentration, and neither reference relates to the production of an alkyl carboxylate, the skilled person could not arrive at the subject-matter of claims 2, 3 or their dependent claims by a combination of Manyik and Fisher.

In light of the above, it is clear that one of ordinary skill would not have been motivated to arrive at the invention as claimed in the present application based on the combined disclosures of McCain and Manyik or Fisher and Manyik. Absent any such

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motivation, a *prima facie* case of obviousness has not been generated in this case.

Reconsideration and withdrawal of the outstanding obviousness rejections are

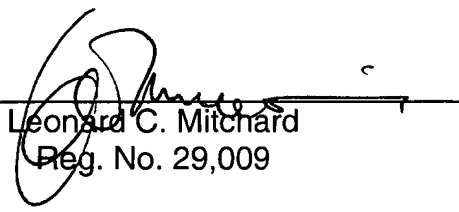
accordingly respectfully requested.

Allowance of the application is awaited.

Respectfully submitted,

**NIXON & VANDERHYE P.C.**

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